

COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH

VECTOR CONTROL PROGRAM



**ANNUAL REPORT
CALENDAR YEAR 2006**

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INTRODUCTION

A vector is any insect, rodent, or animal capable of transmitting human disease or causing human discomfort or injury. The Vector Control Program (VCP) has been protecting the public's health from disease carrying vectors for over 30 years. Since July 1, 1989, the Vector Control Program of the County Department of Environmental Health (DEH) has provided countywide vector prevention and control services under the powers of a vector control district as adopted by the County Board of Supervisors.

Mosquito, rodent, fly, and other vector detection and control programs are provided to reduce the risk of diseases transmitted by these vectors and to minimize nuisances. Surveillance is critical to detecting known and emerging pathogens in the environment prior to human outbreaks of disease. Likewise, a comprehensive control program should be in place to quickly respond to complaints, conduct follow-up on complaints, and regularly inspect and treat known breeding sources.

In 2005 San Diego County property owners approved a Proposition 218 ballot measure that provides funding to continue VCP's outstanding efforts to minimize West Nile Virus and make several other needed improvements. Temporary staff was hired during the summer of 2006 to increase mosquito surveillance and control efforts. Overall the program was a success and will be repeated again in 2007.

VCP core functions include:

- Early detection of public health threats through comprehensive vector **surveillance**
- Protection of public health by **controlling** vectors or exposure to vectors that transmit diseases to humans
- Timely **response** to customer requests to prevent/control vector borne diseases

This report describes the VCP accomplishments in meeting these core functions in 2006.

SURVEILLANCE

MOSQUITO BORNE DISEASES

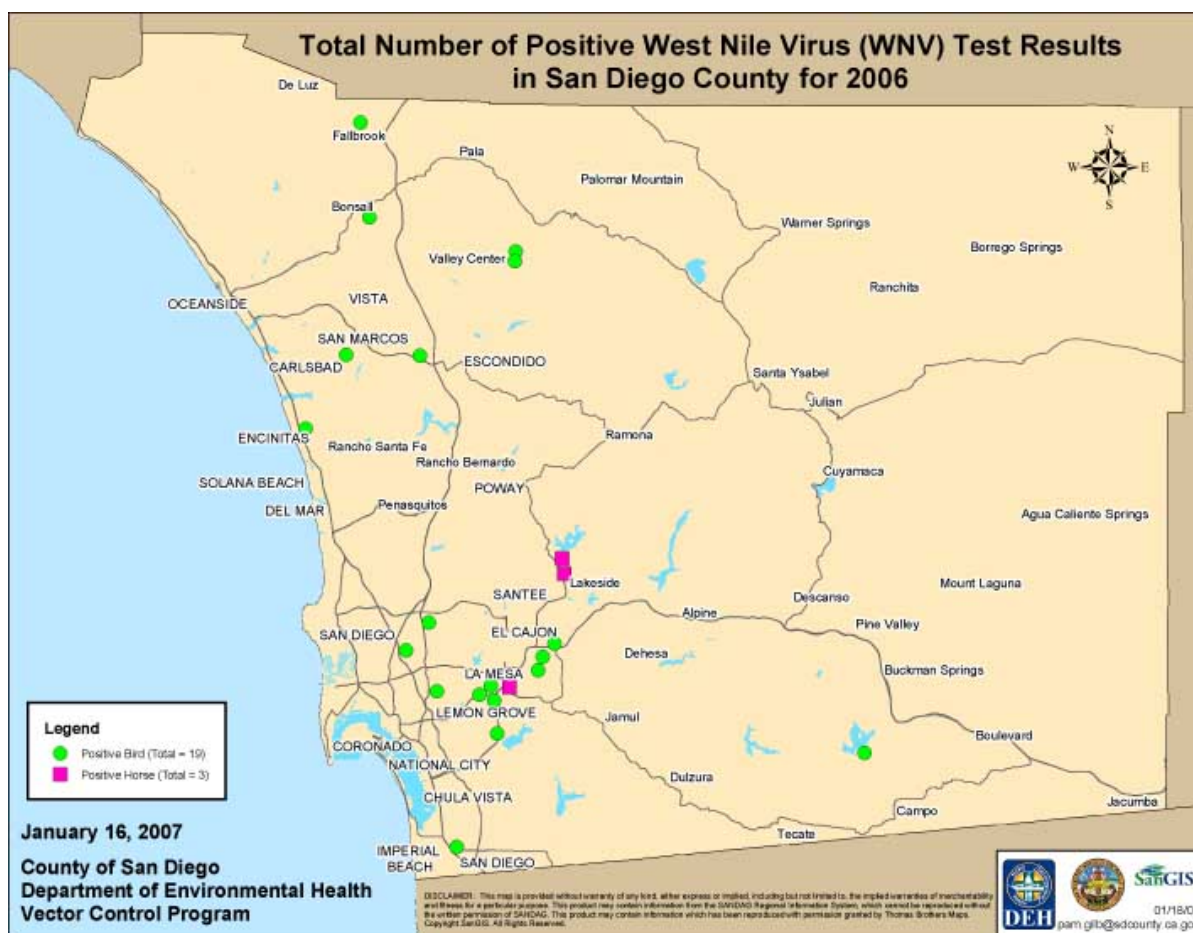
VCP conducts surveillance of mosquitoes that could transmit West Nile Virus (WNV), Western Equine Encephalitis (WEE), and St. Louis Encephalitis (SLE). Testing for West Nile Virus would have also detected the presence of Western Equine Encephalitis and St. Louis Encephalitis, but none of these other arbo-viruses were detected in 2006.

In 2003 the Board of Supervisors adopted the West Nile Virus Strategic Response Plan (Plan), to establish an organized and planned response to the virus within the county. The Plan was updated in 2004 to address the potential use of adulticides if determined necessary. The completed Plan is posted on the website at www.sdfightthebite.com.

The progression of West Nile Virus (WNV) in San Diego County began in 2003 when the virus was discovered in San Diego County with five dead birds and one horse testing positive. In 2004 WNV was found in 34 dead birds and two horses with a broad distribution throughout the county. In 2005 there was increased activity in the wild bird population all over San Diego with 162 birds testing positive from a total of 543 that were tested. Interestingly, no horses tested positive in the county in 2005.

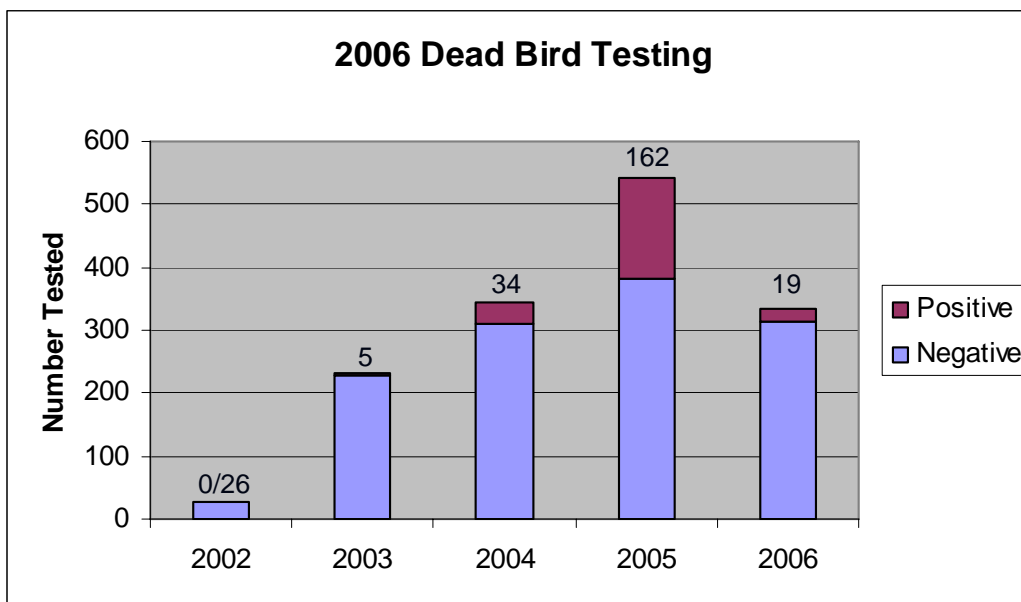
There was an overall decrease in WNV activity in 2006 (*Figure 1*). The VCP tested a total of 334 birds with 19 of those testing positive for WNV. Three horses from the eastern part of the county tested positive for WNV. This year (2006) there was one confirmed locally acquired human case of WNV also from East County.

FIGURE 1
WEST NILE VIRUS POSITIVE DEAD BIRDS IN 2006



Dead bird testing was a valuable surveillance tool in early detection of West Nile virus in the County and State. *Table 1* demonstrates the increase in dead bird testing since 2003. By identifying concentrations of positive dead birds in the county, VCP was able to focus its surveillance efforts in La Mesa, Lakeside and El Cajon. Using the Sheriff's helicopter, VCP conducted surveillance over these areas to locate green swimming pools and previously unidentified ponds. Green pools are typically neglected swimming pools where water is not filtering or moving. The aerial surveillance allowed staff to follow-up on the ground by inspecting these potential breeding sources. VCP staff discovered many new mosquito breeding sources in this manner.

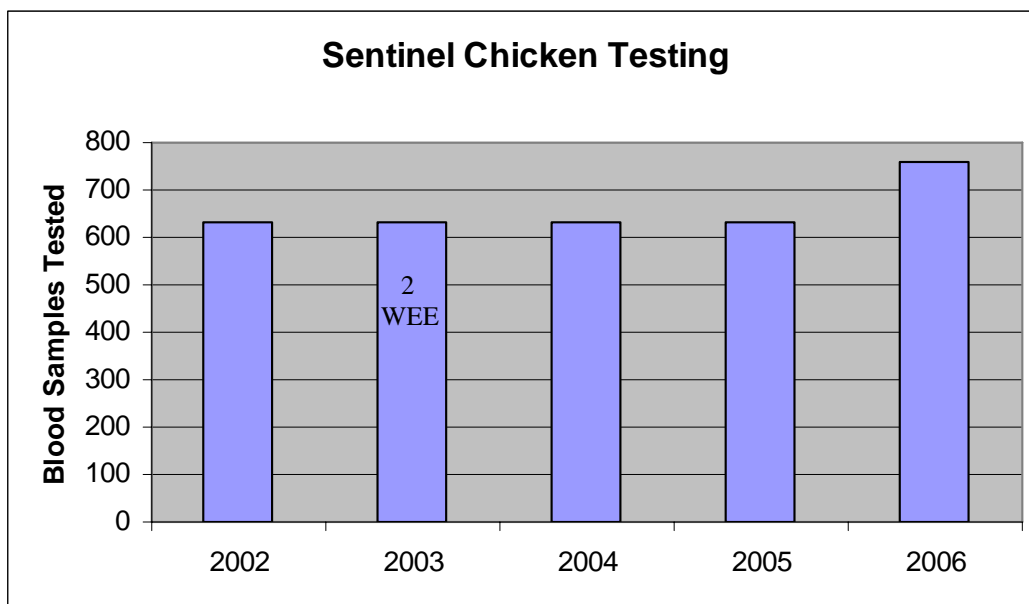
TABLE 1
2006 DEAD BIRD TESTING



As part of the bird testing program, VCP's Vector Ecologists continued to use a new, more rapid test to determine if dead birds were infected with the virus. In the spring of 2005, VCP started using a test known as VecTest™. This was used on all crows, ravens, and jays that were collected and met testing criteria. The test can be performed and results achieved in about 20 minutes. VCP's GIS coordinator then mapped the positive results. This allowed VCP to take control actions right away as opposed to waiting for one or two weeks for results from an outside laboratory. Laboratory analysis is used as a confirmatory tool in the bird testing program. VCP Vector Ecologists contacted all persons submitting positive birds and VCP Technicians investigated and treated any mosquito breeding discovered near the locations where the birds were found.

Table 2 illustrates the testing of sentinel chickens over the last five years. Sentinel chickens are used as an early warning detector for the presence of a mosquito borne diseases. A flock consists of 10 chickens. Sentinel chicken flocks are located at Buena Vista Lagoon, Lake Kumeyaay, Penasquitos Lagoon and the Tijuana River area. In 2003 there were two positive chickens for WEE. The flock at Penasquitos Lagoon is a new addition for 2006. In 2006, no sentinel chickens tested positive for West Nile virus, Western Equine Encephalitis, or St. Louis Encephalitis in San Diego County.

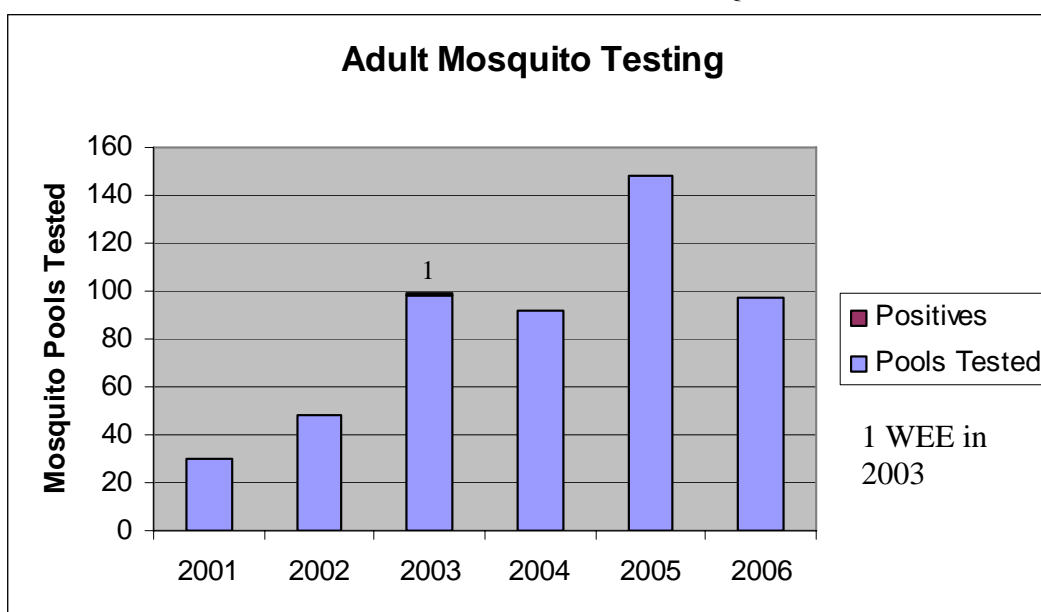
TABLE 2
SENTINEL CHICKEN SURVEILLANCE FOR WNV, WEE AND SLE



In 2003 mosquito trapping and testing increased by 200%, with 98 pools tested. One pool tested positive in 2003. The laboratory prefers 25 to 50 mosquitoes to constitute a “pool.” Vector Control has been testing approximately 100 mosquito pools per season or more depending on the mosquito population. In 2006, 97 mosquito pools were tested, none were positive. There have been no positive mosquito pools since 2003.

Table 3 illustrates the numbers of adult mosquito pools tested since 2001. When Field Technicians discover mosquito breeding sources during complaint investigations and monitoring of known sources, the source is treated with larvicide to stop mosquitoes from maturing into adults. In 2006 the aerial application and use of additional seasonal staff to treat breeding sources resulted in population reductions of mosquitoes. Trapping of mosquitoes in sufficient numbers to constitute a pool was affected as shown in 2006.

TABLE 3
TRAPPING AND TESTING OF ADULT MOSQUITOES



New surveillance devices called “gravid traps” were first used in 2004. These traps are for the collection of female mosquitoes searching for a place to lay their eggs. No positive results within the trapped mosquitoes were found. Additional efforts were made to utilize gravid traps in 2005. While traps were set at many more locations, large numbers of mosquitoes proved rather elusive. Only a small number of sites captured adequate numbers of mosquitoes for testing. Due to the efforts of our temporary and permanent staff several more gravid trap locations were used in 2006. This resulted in a considerably larger number of pools obtained from gravid traps. None of these mosquito pools tested positive for any mosquito borne disease. Additional efforts will be made in 2007 to double the use of gravid traps.

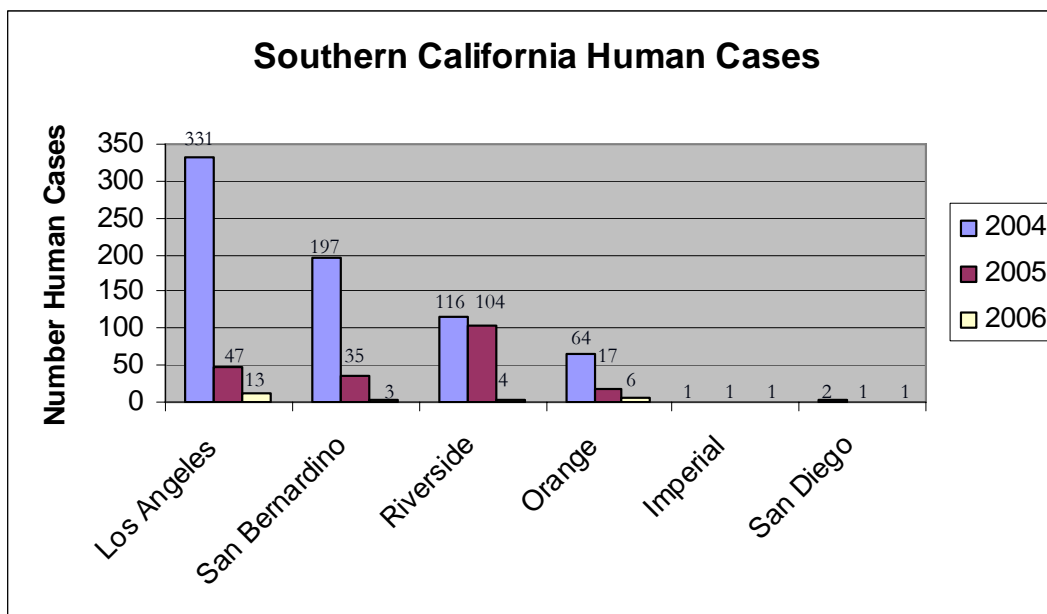
In 2004 there were 2539 WNV illnesses and 100 deaths recorded nationwide according to the Center for Disease Control (CDC.gov) web site. In 2005 there were 3000 WNV illnesses and 116 deaths. In 2006 the number of cases in the nation increased to 4219 however, case numbers declined to 276 in California.

In 2004 statewide there were 829 human illnesses and 27 fatalities, with the majority of cases in Southern California. In 2005 the impact of the virus shifted to northern and central California. For 2006 the cases

were evenly distributed between northern and southern California but case numbers were down substantially overall. The number of human deaths from WNV declined further in 2006 to seven (7).

Table 4 shows the number of positive virus results according to CDC for southern California counties from 2004 to 2006. As can be seen below, the number of cases has dropped in most areas of southern California.

TABLE 4
2004, 2005 AND 2006 SOUTHERN CALIFORNIA HUMAN CASES



Performance Improvement Goals

The following goals have been set for mosquito surveillance during mosquito breeding season:

- Set at least 10 gravid traps each week
- Set 50 adult mosquito traps each week

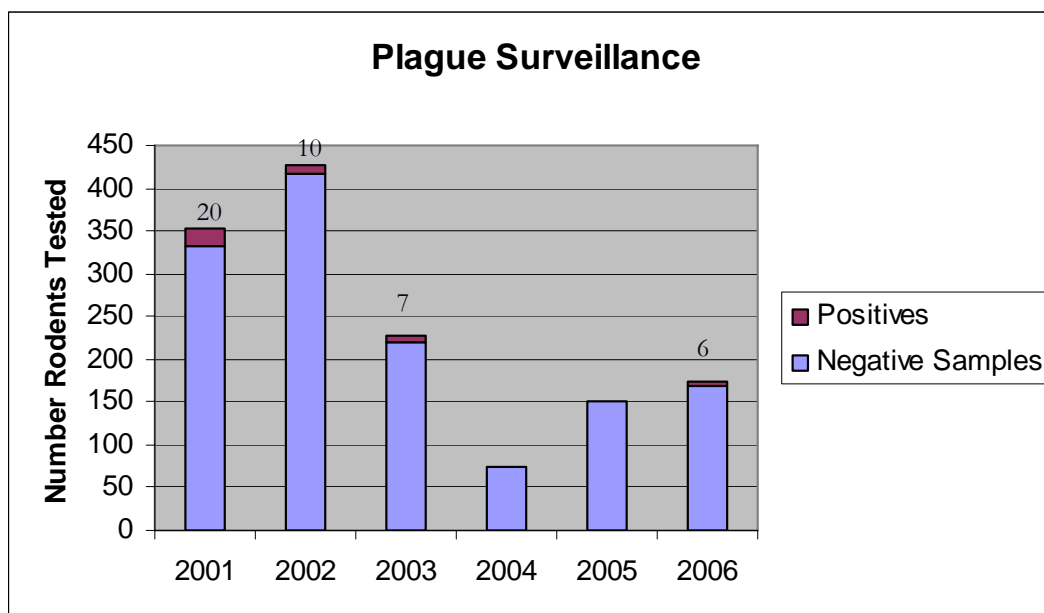
RODENT BORNE DISEASES

PLAGUE

No human cases of plague were reported in San Diego County during 2006. Plague infected fleas bite and infect a rodent, usually ground squirrels and these rodents can act as reservoirs. Humans and their pets, when visiting campgrounds or other rural areas, can be infected by being bitten by infected fleas. Ground squirrels are routinely tested at campgrounds by collecting blood samples and sending them for plague testing.

There were 175 ground squirrels sampled in 2006 and six of these tested positive for plague. However, all six positive ground squirrels were from the same higher elevation campground in our local mountains. This was a significant increase in plague surveillance, as compared to 2005, but still less than 2003 when 228 ground squirrels were tested. Plague surveillance has been conducted mostly at higher elevation localities and has often yielded one or more plague-seropositive ground squirrels each year. In 2006 plague surveillance was expanded to lower elevations of the county. This testing verified past indicators that plague currently occurs only at higher elevations such as our local mountains. This year, 2007, plague surveillance will be expanded. *Table 5* describes plague surveillance over the past six years.

TABLE 5
PLAGUE SURVEILLANCE



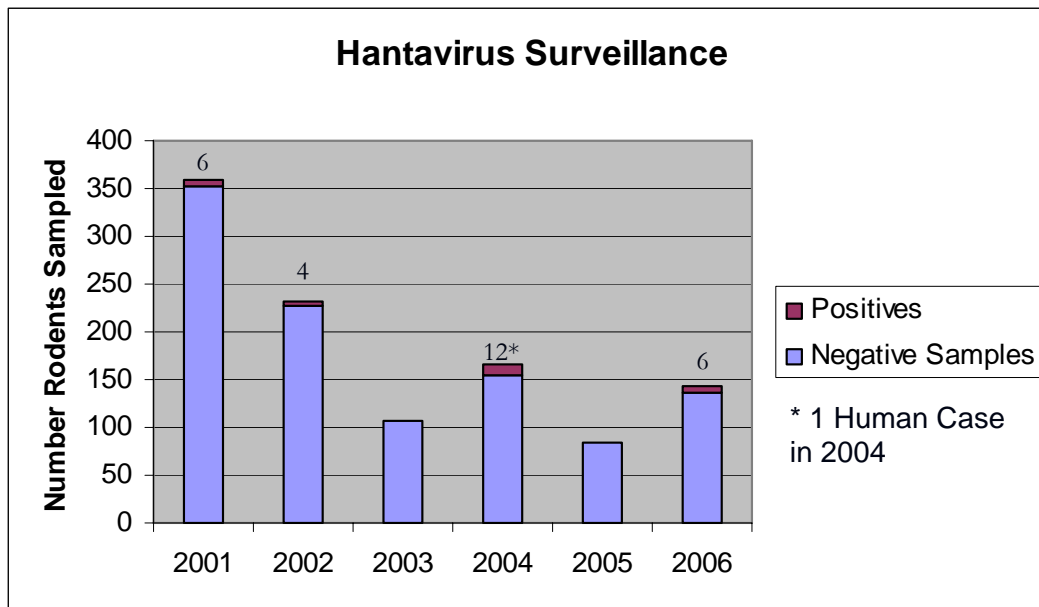
HANTAVIRUS

Both the hemorrhagic and respiratory strains of Hantavirus occur in wild mice in San Diego County. Humans typically become infected with Hantavirus by breathing air-borne particles of wild mouse droppings contaminated with the virus. Most human cases occur when people open up and occupy mountain cabins or other small-enclosed structures, which are infested with wild mice.

In 2004, the first locally acquired human case of Hantavirus was reported in the East County community of Campo. During 2005, 84 wild mice were sampled and none tested positive for Hantavirus. Sampling increased in 2006 to 143 wild mice with six testing positive.

Table 6 describes Hantavirus surveillance for the past six years. Hantavirus testing will be increased in 2007. VCP has created a site on its webpage: www.SDVector.com and a brochure to inform residents how to properly cleanup mouse droppings to help prevent them from acquiring Hantavirus. When wild mice test positive for Hantavirus, the site is re-sampled to determine the prevalence of the virus in the wild mouse population and the area is posted with animal caution signs.

TABLE 6
HANTAVIRUS SURVEILLANCE



Performance Improvement Goals

- Twice a week, from March through November, test ground squirrels for plague
- Weekly collect and test mice for hantavirus

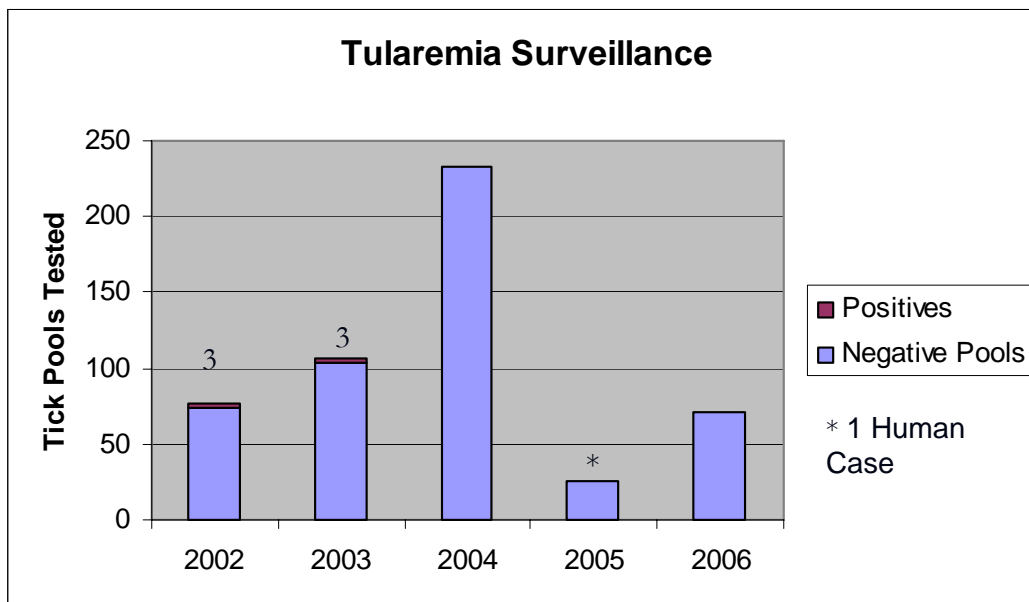
TICK BORNE DISEASES

TULAREMIA

Tularemia is typically found in some of the smaller mammals and, in particular, rabbits. The two common species of *Dermacentor* ticks found in the county can pick up the disease when they feed on rabbits and pass it to the next animal on which they feed. It is important to point out though that tick bites are not the only way tularemia can be transmitted. Other biting insects can transmit the bacteria and the disease can be transmitted by direct contact with an infected animal. This is why it is very important not to handle any wild animals, especially if they appear to be ill.

Table 7 describes the surveillance conducted for tularemia over the past five years. In 2006, 71 pools (10 ticks per pool) of ticks in the *Dermacentor* group were submitted for testing. There were no positive results. It was still a bit difficult to find large numbers of ticks during 2006 but populations were higher than in 2005.

TABLE 7
TULAREMIA SURVEILLANCE

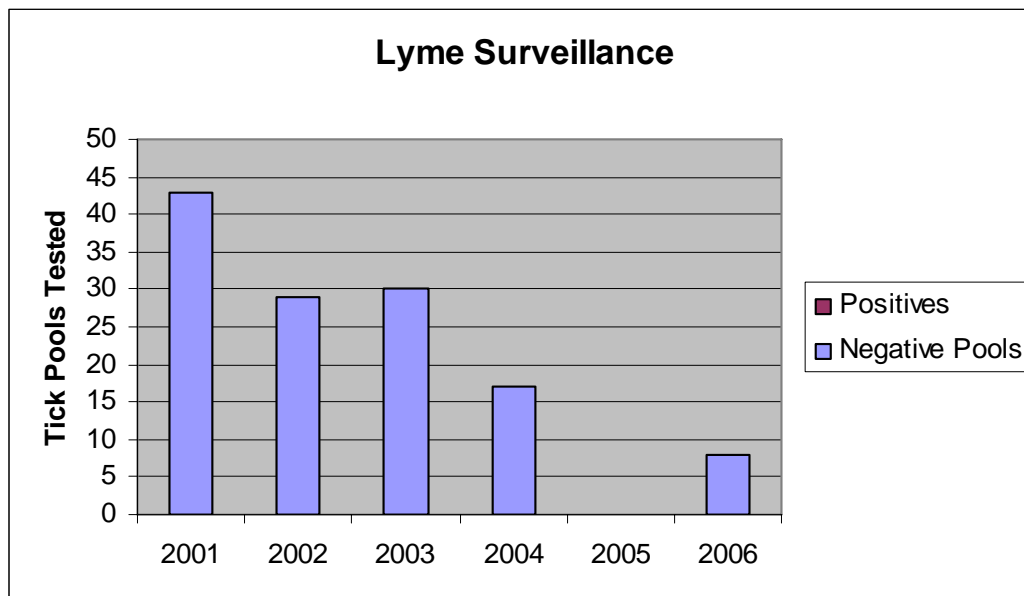


LYME DISEASE

Testing ticks in 1994 and 1995 demonstrated that Lyme disease does occur in San Diego County, but there have been no positive ticks since 1995. The primary vector for this disease, *Ixodes Pacificus* or Western Black-Legged Tick, is commonly found in most rural areas of the county. During 2005, we were unable to collect enough ticks to perform any Lyme testing. The heavy rains during tick season may have lowered the population or spread them out so thin that it made collecting very difficult. The populations in 2006 were not much better but we were able to find enough ticks to submit 8 pools for testing. All of those pools tested negative.

One human Lyme disease case was diagnosed in San Diego County in 2006. It is thought that the case may have been locally acquired, due to lack of travel on the part of the victim. Areas where the victim had been were checked for ticks and warning signs were posted as a precaution. *Table 8* illustrates the surveillance conducted for Lyme disease over the past six years.

TABLE 8
LYME DISEASE SURVEILLANCE



Performance Improvement Goal

- Detect the presence of tularemia and Lyme disease through twice weekly collecting of ticks from November through March

CONTROL

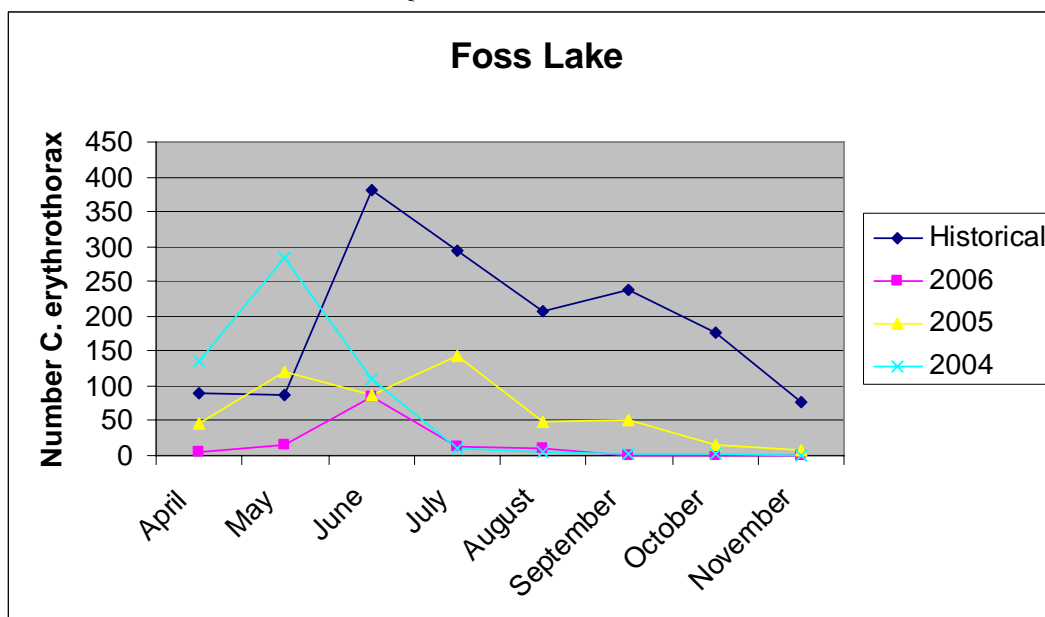
MOSQUITOES

To control mosquitoes, the VCP conducts inspections and identifies mosquito breeding sources. The sources include privately and publicly own lands with rivers, streams, marshlands, lagoons, ponds, and various other man-made and natural sources of standing water. During 2005, 500 additional mosquito breeding sources were identified and in 2006, 300 more site were added. The additional breeding sources brought the total to 1,800 identified mosquito breeding sites. Land ownership of mosquito breeding sources has been identified using Geographic Information Systems (GIS). This has enabled VCP staff to educate the property owner as to their responsibility in managing standing water. Known mosquito breeding sources are evaluated during the winter months to confirm location and design treatment plans

for these sources. This off season effort creates routes for seasonal workers, who then treat locations during the mosquito breeding season.

VCP used aerial applications in 2006 to control mosquito breeding in inaccessible locations next to urban interfaces that historically produced significant numbers of mosquitoes. Following approval of the Ballot Measure in July 2005 additional aerial application sites were added. The addition of more sites in 2006 brought the total to 42 sites. *Table 9* illustrates the effectiveness of the aerial applications for the past three years at Foss Lake compared to historical levels. This represents the overall control received at most aerial application sites. A few monitoring locations showed greater numbers of adult mosquitoes despite aerial applications. This is under investigation, but can likely be attributed to increased vegetation growth at these sites that provides greater protection from natural predators and our application of larvicide.

TABLE 9
ADULT MOSQUITO POPULATION AT FOSS LAKE



Aerial applications were conducted using a contract helicopter service. Field calibration of the contractor's new application equipment was performed before the start of the mosquito season in 2006. The Vector Control Program is continuing to receive support from federal and state wildlife officials that have deemed helicopter applications appropriate. Use of the helicopter is far less invasive to sensitive habitats than efforts by VCP staff conducting land treatment.

Mosquito fish, *Gambusia affinis*, are natural predators of mosquito larvae and VCP rears them in large tanks. Field Technicians place mosquito fish in man-made settings in response to finding larvae. In 2005, mosquito fish distribution sites were restocked with fish every two weeks and VCP continues to offer 13 locations where the public can pickup free mosquito fish. The locations are evenly distributed throughout the county. Each of these locations hosts an educational display and is promoted on the website www.sdfightthebite.com and in the media.

Future mosquito breeding source reduction efforts include working with County and City Planning and Public Works departments to ensure that new construction of storm-water Best Management Practices (BMP) are built and maintained so they will not breed mosquitoes.

Performance Improvement Goals

- Survey and control mosquito populations consistently throughout the county in a proactive manner to reduce/control populations to acceptable levels of risk/complaint (50% of historical levels) through aerial and land application of larvicides
- Identify, document and treat new mosquito breeding sources
- Maintain the reduction of justified mosquito complaints by 35% from 2003 levels
- Initiate the development of a Vector Habitat Remediation Program that will evaluate, modify and /or eliminate identified mosquito breeding sources
- Initiate a program which facilitates the development of structural stormwater Best Management Practices (BMPs) with a target goal of 50 plans

DOMESTIC RATS

VCP assists residents with their rat control efforts by providing inspections and consultations. These include efforts to exclude rats from residents' homes and businesses. In 2006 staff expanded community awareness by making contact on either side and behind every dwelling where evidence of rats was found. The VCP staff performs exterior site inspections to educate residents regarding the best methods to exclude rats from entering the home. During these site visits a rat control starter kit is provided to the home owner. These kits include a bait station, traps, and instruction materials for control measures. The web site: www.SDVector.com has information available on domestic rat control as well as an ability to file a Request for Service on-line. Staff has made several presentations to homeowner and community groups on rat control and has distributed educational materials at community events. VCP staff coordinates work with other regional agencies to prevent and eliminate rat infestations and harborages.

Performance Improvement Goals

- Maintain a 3-day contact and/or field response time for rat complaints
- Provide Rat Starter Kits as part of an onsite inspection for rats

OTHER RODENTS

Other animals such as ground squirrels are routinely monitored in the back country camping areas. When plague is detected VCP dusts ground squirrel burrows to control flea populations and control the spread of plague to domestic animals and humans. Rangers are notified and signs are posted warning campers of the presence of plague and precautions to take with their pets to prevent the transmission of the disease. This is done in cooperation with the State Department of Health Services.

Performance Improvement Goals

- Treat ground squirrel burrows where plague has been found to eliminate fleas and stop the spread of plague

FLIES

VCP technicians respond to residential fly complaints with public education about sanitation and fly breeding habitats. Through the use of routine poultry ranch inspections and the annual ranch submittal of their proposal for prevention and control of fly breeding, fly complaints involving ranches have been significantly reduced.

Performance Improvement Goals

- Maintain the reduction of the number of justified complaints from historical high by reviewing, approving and enforcing manure management plans for poultry ranches each year
- Inspect each poultry ranch in the county four times per year.

OUTREACH

Health education, outreach, and raising awareness in the county are all integral parts of the West Nile Virus (WNV) Strategic Response Plan. In 2006, we increased outreach efforts with the addition of three new student workers. An aggressive proactive approach was used to continue educating county residents about the risks of WNV and the preventive measures they can take to protect themselves and their communities. New strategies included conducting educational presentations to high-risk target groups such as seniors and the Spanish speaking community, staffing informational displays at Health Expos and Street Fairs, and collaborating with different County and City departments and organizations.

We increased the types of educational materials that we distribute to include a dual English/Spanish WNV DVD, Spanish WNV Bookmarks, WNV Calendars, Mosquito Activity Books, WNV Magnets, and WNV Stickers. These materials were used to increase the visibility of Vector Control and as a way to reach a larger audience. We distributed over 79,000 WNV pamphlets and bookmarks at more than 930 public locations such as all public libraries, public health centers, county public counters, homeless shelters, WIC offices, and city halls throughout the county. Over 200 new locations were added to our outreach database. Additionally, we distributed over 100 copies of a County Television Network-produced WNV video in English and Spanish to community clinics, libraries, high schools, and community groups.

The outreach staff further developed and improved the county's WNV website, www.SDFightTheBite.com, providing valuable, up-to-date information for residents about personal protection and elimination of mosquito breeding sites around their homes. They included Federal, State, and local links for additional information and tracking of WNV and posted the WNV Video and public service announcements for personal viewing. Outreach staff utilized press releases, press conferences and media events to help deliver WNV prevention information. They distributed press packets containing educational materials to all media who attended the events and distributed Public Service Announcements to all of the local television stations.

In addition to West Nile Virus, general vector outreach and education was increased. Rats, Hantavirus and Plague were added to the outreach agenda. The same aggressive proactive approach that was used for the WNV outreach campaign in 2005 was used towards Rats, Hantavirus, and Plague. Presentations, tabletop displays, and pamphlets were created and distributed to the public for all four topics. Rural locations throughout the county were targeted for Hantavirus and Plague education. Rat Control Starter Kits were created to educate the public about how to deal with rat problems themselves and to publicize Vector

Control Program rat services. English and Spanish rat pamphlets were developed, printed and distributed and the County Television Network (CTN) produced a 20-minute Rat video.

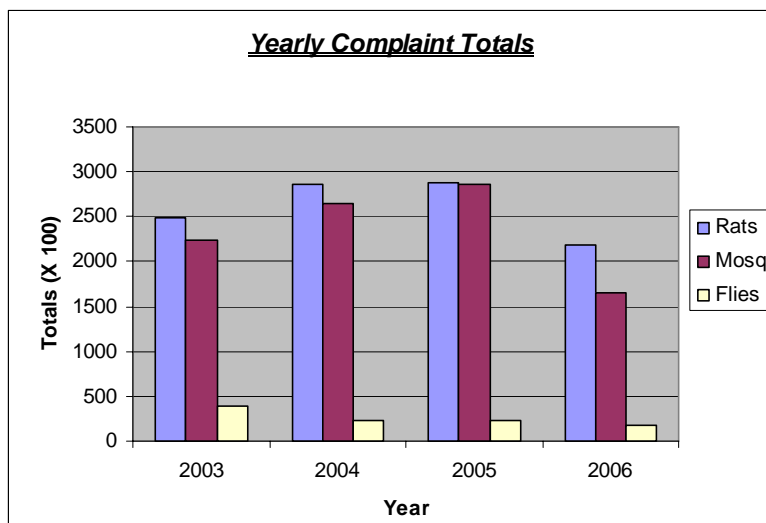
Performance Improvement Goals

- Create an outreach educational assessment tool
- Increase classroom education about vector-borne disease prevention and personal protection
- Distribute over 50,000 pieces of educational material each year
- Speak at 50 events or more, targeting high-risk populations
- Create a website for hantavirus
- Create a Spanish version of the WNV website and a Spanish version of the rat video

RESPONSE/CUSTOMER SERVICE

In 2006 staff responded to 1,392 citizen complaints or service requests regarding mosquito nuisances and breeding, *Table 10*. This is a 38% decrease from 2003 when we received 2247 mosquito complaints. While many complaints involved major mosquito breeding sources, most involved smaller or intermittent backyard sources. VCP staff responded to 1,620 citizen complaints or service requests relating to domestic rats, a 46% decrease from 2003 when we received 3000 complaints. VCP responded to 132 citizen complaints of excessive numbers of flies. This is a decrease of 41% from 2005 when VCP responded to 224 fly complaints. Of the 2006 complaints, 23 involved commercial poultry ranches and 109 were related to residential and commercial businesses.

TABLE 10
VECTOR CONTROL PROGRAM SERVICE REQUESTS

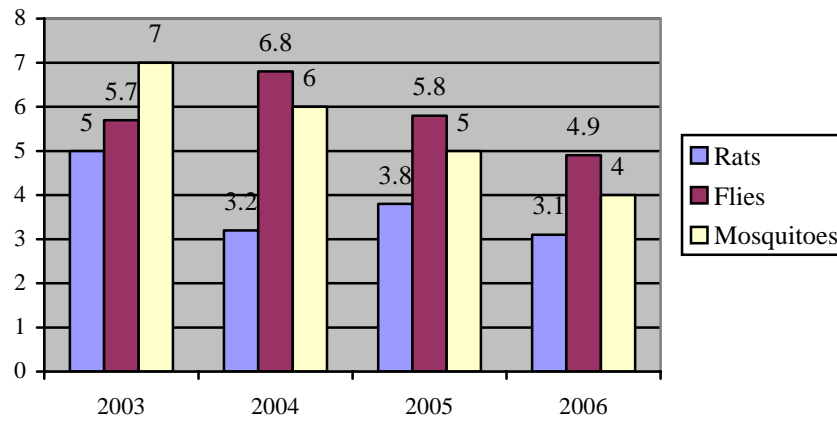


Each month VCP sends a customer service survey to 20% of the complainants from the prior month. Of those survey forms returned to VCP, 98% of the respondents rated the service they received as Satisfactory or better and 75% of the respondents rated the service as Excellent.

During 2006 the average response time, including weekends and holidays, for complaints is shown below on *Table 11*:

- 4.0 days for mosquito complaint investigation
- 3.1 days for rat complaint investigation
- 4.9 days for fly complaint investigation

TABLE 11
OVERALL AVERAGE COMPLAINT RESPONSE TIME



Performance Improvement Goals

- Respond to all complaints within three working days
- Resolve 90% of the complaints within 30 days

PROGRAM FUNDING

In 2005 the County of San Diego conducted a Proposition 218 ballot measure seeking the approval of county property owners of a new assessment. Ballots were mailed to over 700,000 property owners in May 2005. As specified in Proposition 218, the balloting period was 45 days with a public hearing conducted by the Board of Supervisors to conclude the balloting process. On July 13, 2005 the Board of Supervisors announced that the ballot measure passed by 61.46%.

The pre-existing service charge will continue to provide \$2.2 million per year and the new assessment will result in \$5.3 million, resulting in \$8 million in the third year of the assessment. The annual process for determining the per property assessment rate includes developing a budget which is then incorporated into an Engineer's Report and a rate is then proposed. The Board of Supervisors will hold a public hearing after which they will determine the new assessment rate for the next year. Because of the one-time costs in the first year of the assessment there was a reduction in the rate in the second year. The third year of the assessment has also been reduced due to an anticipated reduction in program costs. The 2007-2008 proposed Single Family Equivalent assessment rate is \$5.92, a 7% reduction from 2006-2007.